The Influence of Using Vitamin C and Probiotic (ROEMIN W2®) on Productive Performance of Growing New Zealand White Rabbits

Haiam S. Abd Elhalim
Animal Production Dept., Fac. of Agric., Suez Canal University, Ismailia, Egypt.

Received: *20/3/2008*

Abstract: A total of fifty male New Zealand White rabbits (NZW) of 5 weeks of age with an average initial body weight of 652 ± 66.0 g were used to study the effect of supplementing tap water with Vit. C and probiotic (Roemin W2®) on growth performance and some blood constituents of New Zealand White rabbits during summer months (July–August). Rabbits were randomly assigned to five equal groups (10 animals each) and kept in individual battery cages, in a naturally ventilated house under similar managerial, hygienic and environmental conditions. Average ambient temperature and relative humidity were 32.9°C and 58.4 %, respectively. The rabbits in the first group received non-treated tap water (Control) and the other groups received tap water supplemented with 0.5 or 1g /Liter of Vit. C or probiotic (Roemin W2®), respectively, during the experimental period which lasted for 6 weeks. The results showed that, body weight (BW), total and daily weight gain (TWG and DWG), serum total protein, total lipids, triglycerides and cholesterol were significantly (P≤0.05) affected by water supplementation with Vit. C or Roemin W2®. Rabbits drank water with Roemin W2® at level 1 g/L showed significantly (P≤0.05) the highest final body weight, total and daily weight gain and serum total protein. DWG in this group was significantly increased (P≤0.05) by 6.92% as compared with the control group. Also, data revealed that treatment of growing rabbits during summer time with both of Vit. C or Roemin W2® at 0.5 or 1 g /L water improved feed conversion ratio (FCR) as compared with the control group by about 1.48, 5.93, 5.93 and 10.39%, respectively. In addition, the serum total lipids, triglycerides and cholesterol values were significantly (P≤0.05) decreased in the groups supplemented with the two additives comparing to unsupplemented control group. Kidney function and liver function did not influenced significantly by different supplementation. The results indicated an improvement in the economical efficiency (EE) or relative economic efficiency (REE) for rabbits received water with Roemin W2® at 0.5 or 1 g/L as compared with other groups. It is concluded that Roemin W2® at levels 0.5 and 1 g /L can safely be used as an additive for growing NZW male rabbits with no adverse effects on growth performance, health condition and gave the best economical efficiency.

Keywords: Rabbits, Vit. C, Probiotic, Growth performance, Serum constituents and Economical efficiency.

INTRODUCTION

Rabbits seem to have good potential as a meat producing animal and suitable solution to solve the lack of animal protein. In hot climate regions, where most of the developing countries are located, rabbit production as any other animal production, is faced with many problems such as heat stress, poor quality food, diseases and parasites. Heat stress is the major constraint on animal productivity. Increasing the ambient temperature above 30 °C has a deleterious consequence on rabbit performance (Al-Shanty, 2003). Growth and reproduction are impaired as a result of the drastic changes in biological functions caused by heat stress (Marai *et. al.* 1999 and 2000). In order to overcome the adverse effect of heat stress a considerable amount of research has been conducted depending upon nutritional conditions such as supplementing the diet of heat stressed rabbits with vitamin C. Abdel-Hamid and El-Adawy (1999) noted that supplementation ascorbic acid at 300 or 600 mg/kg of rabbit's diet increased significantly (P<0.05) growth performance index, economical efficiency and improved feed conversion ratio. Abdel-Monem (2001) showed that the final live body weight and daily body gain were increased significantly (P< 0.001) and feed conversion ratio was improved by using ascorbic acid as feed additives. Also, Al-Shanty, 2003) found significant (P< 0.05) improvement in final body weight and total live body gain by adding 1.0 gm ascorbic acid/ L water. Also, (Teeter, 1995), found that feed additives and growth promoters could help rabbits to withstand heat stress. Probiotics are live microorganisms that, when administered through the digestive route, have a positive impact on the host's health (Guillot, 2001). In relation to the importance of ceacal microbial fermentation, the digestive process is very complex and fragile in rabbits. That is why rabbits are rather sensitive to enteric diseases and especially when they are exposed to negative impacts, e.g. weaning or heat stress, causing high losses. This problem can be avoided by antibiotics. However, because of the general intention to limit antibiotics in animal feed as growth promoter concerning side effects on both animals and man, probiotics that contain yeast, live bacteria or bacterial spores can also prevent enteric diseases of rabbits. Instead of growth promoters with antibiotics that kill some of the rabbit's own gastrointestinal flora, probiotics promote gut colonization and stabilize eubiosis by competitive growth against harmful microorganisms, reducing the intestinal pH with production of lactic acid and encouraging digestion by producing enzymes and vitamins. These functions strengthen the animal's own nonspecific immune defense (Fortun-Lamothe and Drouet-Vlard, 2002).

The aim of this study was to investigate the effect of inclusion both of Vit. C or probiotic ROEMIN W2® in drinking water on the performance of growing New

Zealand White rabbits under Egyptian summer conditions.

MATERIALS AND METHODS

The present work was carried out at the Poultry Farm, Faculty of Agriculture, Suez Canal University, Ismailia, Egypt, during summer months, from 8 th July till 19 th August, 2006.

A total of fifty male New Zealand White rabbits ((NZW) of 5 weeks of age with an average initial body weight of 652 ± 66.0 g were randomly assigned to five equal groups (10 animals each). Animals were kept individually in wire cages in a naturally ventilated house under similar managerial, hygienic and environmental conditions. Artificial light source was used, giving a total 16 hours of light per day during the experimental period. The rabbits in the first group received non-treated tap water (Control) and the other groups received tap water supplemented with 0.5 or 1g/ liter either Vit. C (L-ascorbic acid) or probiotic (RoeminW2®), respectively. Probiotic Roemin W2® (China Way Corporation 16-4 No. 424 Chung Ming Road. Taichung Taiwan, consists of active *Lactobacillus* (500,000,000 cells/g) and digestive enzymes.

Vitamin C and Roemin W2® were prepared and provided fresh every day for six weeks until the end of the study. The Animals of all groups were given a pelleted commercial diet (Manufactured by El-Mourshedy Factory, Meet-Ghamr, Dakahilia governorate) *ad libitum* to cover the recommended nutrients of growing rabbits according to N.R.C. (1984). The diet consists of yellow corn, soybean meal (44%), Limestone, corn gluten (60%), wheat bran, bone meal, clover hay, barley, salt, molasses and vitamin and mineral premix. The chemical composition of the experimental diet is shown in Table (1). Proximate analysis of diet was determined according to standard methods of the Association of Official Analytical Chemists (AOAC, 1995). Temperature and relative humidity were recorded daily at noon (12.00) pm during the experimental period. Average daytime temperature and relative humidity were 32.9°C and 58.4 %, respectively. The animals were daily provided fresh water with or without additives at 9.00 a.m. and the residuals were measured just prior 9.00 a.m. in the next day. Water intake was recorded daily, then weekly. Feed consumption (g) was individually recorded weekly during the experimental period. The rabbits were weighed at the beginning of the experiment and at weekly intervals thereafter till they reached 11 weeks of age. Rabbit's growth performance was assessed by measuring body weight, weight gain and feed conversion. Blood samples at the end of experiment, were collected from the ear vein of three rabbits from each group to estimate some blood constituents. Blood was collected in sterile clean tube and centrifuged for 15 min. at 3000 rpm. Serum was kept at a refrigerator (-20°C) up to assaying of total protein (mg/dl), creatinie (mg/dl), uric acid (mg/dl), total lipids (mg/dl), cholesterol (mg/dl), triglycerides (mg/dl), transaminase enzyme activities (GOT and GPT, Unit/l), using commercial reagent kits purchased from Diamond diagnostic (Egypt) following the same procedure as described by manufactures.

Economical efficiency % (Y) was calculated according to the following equation: Y= [(A-B)/B] x100, where A is the selling price of obtained gain (13.0 Egyptian pounds, i.e. L.E /kg.) and B is the total feed cost (feed + additive) of this gain (L.E.). The cost of one kilogram of both ascorbic acid and Roemin W2® were (43.00 and 35. 00 L.E., respectively).

Statistical analysis was computed using the General Linear Model (GLM) procedure of SAS (SAS Institute Inc., 1998), and the significant differences between means were detected according to Duncan's multiple range test (Duncan, 1955).

Table (1): Chemical composition (%) of the experimental diet.

Items	DM	OM	CP	CF	EE	NFE	ASH
Air dry	89	80.87	14.94	14.25	3.45	48.23	8.13
Dry matter basis	100	90.87	16.79	16.01	3.88	54.19	9.13

RESULTS AND DISCUSSION

Growth performance:

Data on growth performance of NZW rabbits as affected by water supplementation with Vit. C or Roemin W2® is summarized in Table (2). At 11 weeks of age, there were significant differences (P≤0.05) among the experimental groups in body weight (BW) and total and daily weight gain (TWG and DWG), (Table 2). Rabbits drank water with Roemin W2® at level 1 g/L showed significantly (P≤0.05) the highest final body weight and total weight gain. DWG in this group was significantly increased (P≤0.05) by 6.92% as compared with the control group. While the other levels of supplementation either with 0.5 or 1 g of Vit. C or 0.5 g of Roemin W2® had insignificant higher DWG values than the control group. These results are in agreement with those reported by El-Adawy *et al.* (2002) who reported that the final body weight of NZW rabbits (at 14 weeks), daily weight gain and PI increased significantly (P≤0.05) in groups fed diets supplemented with 0.15 and 0.2 % Biogen. Soliman *et al.* (2000) reported also NZW rabbits fed diet supplemented with yeast culture 2 g/kg diet attained significantly (P≤0.05) the heaviest final body weight and daily weight gain. Also, Abdel-Samee (1995) fed growing rabbits maintained under summer conditions, diets unsupplemented (control) or supplemented with either avoparcin (200 ppm), flavomycin (125 ppm) or zinc bacitracin (150 ppm) and noted that the adverse effect of heat stress could be alleviated by probiotics resulting in a 10% improvement in DWG (26.3-26.9 vs 24.3

g/d), However, Gippert *et al.* (1992) found only a 3% increase in DWG in poorer conditions (commercial unit and in summer, 29.5 vs 28.7g/d) but an 8% improvement in more favorable facilities (experimental farm, 31.2 vs 29.3 g/d), when growing rabbits (4 – 12 wks old) fed diet with probiotic Lacto-Saac at 1 gm/ton, compared to the control group. In contrary, Paulius *et al.* (2006) reported that addition of probiotic BioPlus 2B® at 400 mg/kg diet did not significantly affect the body weight and daily weight gain (DWG) of New Zealand White rabbits between 35 and 77 days of age.

The results in Table (2), showed no significant differences among groups in total and daily feed consumption (TFC and DFC) and feed conversion ratio (FCR). Also, data revealed that addition of Vit. C or Roemin W2® at 0.5 or 1 g /L water had insignificantly improved FCR as compared with control group by about 1.48, 5.93, 5.93 and 10.39%, respectively. The improvement in growth performance of rabbits with probiotic supplementation may be attributed to a lower incidence of enteritis problems as a result of the production of lactic acid by *lactobacillus acidophilus* in the digestive tract of rabbits and thus an inhibited growth of the pathogenic bacteria (Ismail *et al.,* 2004) and the improvement of the beneficial caecum microbial content (Shanmuganathan *et al.,* 2004). Using broiler chicks, Zeweil *et al.* (2007) reported that the highest body weight and the best feed conversion ratio of the broiler groups fed diets supplemented with Roemin W2® or Biogen could be attributed to the change in the balance of enteric flora in the intestine, availability of nutrients, stimulation of the intestinal villi thus helping better absorption of nutrients and improving immune capabilities of the host.

Blood constituents:

As shown in Table (3), adding the tested additives to rabbit's drinking water had significant effects on some blood constituents. The results revealed that the concentration of serum total protein was higher ($P \leq 0.05$) in groups drank water with Vit. C or Roemin W2® at the two doses (0.5 and 1g/l water) compared with the control group. El-Adawy *et al.* (2002) observed similar results when added 0.1, 0.15 and 0.2 % Biogen to rabbits diet. The increase of total protein in blood rabbits supplemented with the two additives my be associated with improvement in crude protein digestibility, decrease intestinal pH that accordingly weakens the growth of most pathogenic bacteria, this leads to optimal enzyme activity (Hoyos and Cruz, 1990). In addition, the serum total lipids, triglycerides and cholesterol values were significantly ($P \leq 0.05$) decreased in groups received water with the two additives comparing to un-supplemented control group (Table 3), under summer conditions. Al-Shanty (2003) reported that blood cholesterol and triglycerides were significantly ($P \leq 0.05$) increased but total protein and creatinine were not affected by supplementing drinking water with Vit. C (1 g/L water) compared with non supplemented group. The significant decrease in cholesterol and triglyceride in vitamin C treatments may be due to the antioxidant properties of vitamin C and to its ability to stimulate the conversion of cholesterol to bile acids, an important pathway of elimination (Ibrahim, 2005). Also, results reported here in agree with those found by Ismail *et al.* (2004) who observed that plasma cholesterol was decreased ($P<0.01$) by 19.3, 28.6, 18.2 and 24.6 % in the rabbits fed diets supplemented with 1.0 and 1.5 g/kg of Lacto-Sacc and Bio-Mos, respectively. Tollba *et al.* (2004) reported that adding Lacto Sacc or Yea Sacc to broiler diets (1 kg / ton feed) reduced ($P<0.05$) plasma cholesterol and total lipids. Also, Zanaty (2002) reported that total lipids and total cholesterol were significantly decreased by the addition of Biogen to the diet of rabbits at level 1 g/kg diet. This reduction may be explained as mentioned by Tortuero *et al.* (1975) who attributed that to these bacteria may assimilate or degrade the cholesterol to bile acids followed by deconjugation to prevent resyntheis. However, some *lactobacilli* have a direct effect on cholesterol levels by assimilation and removal from the growth medium (Fuller, 1989). The obtained results presented in the present study were also in agreement with those of Zeweil *et al.* (2006) who confirmed the important roles of gastrointestinal tract microorganisms in recycling of lipids. Likewise, primary bile salts in the presence of specific microorganisms such as *S. Faecium, L. Acidophilus* and *Saccharomyces Cervisiae* are prevented from the re-absorption and have more chance to be converted to second type and this inhibits their absorption. On the other hand, Mahdavi *et al.* (2005) indicated that microorganisms such as *Bacillus subtilis*; *Bacillus liceniformis* are able to synthesize estrase enzymes along side with lipase enzymes, which the former converts free fatty acids to esterified form different from triglyceride to intestinal content and finally less chance for triglyceride absorption into the plasma. In contrary, El-Adawy *et al.* (2002) reported that plasma total lipids were significantly ($P<0.01$) higher in groups fed diets supplemented with Biogen especially at levels 0.15 and 0.2 %.

Kidney function measures (creatinine and uric acid in serum) and liver function measures (GOT and GPT in serum) have not influenced significantly by adding both of Vit.C or Roemin W2® to rabbits drinking water. These results are compatible with data found by (Zanaty, 2002 and Soliman *et al.,* 2000) with rabbits. Similarly, Abd El-Azeem (2002) concluded that broiler chicks fed yeast culture recorded insignificant effects on GOT, GPT enzyme activity and creatinine levels. These results indicated that application of Vit. C or Roemin W2® at the two doses was safe as additives to the NZW growing male rabbits.

Economical efficiency:

Data concerning economical evaluation are summarized in Table (4). The present results indicated an improvement in the economical efficiency % or relative economic efficiency (REE) for rabbits drank water with Roemin W2® at 0.5 or 1 g/L as compared with other groups. These values were due to the better values of daily weight gain and feed conversion ratio for these groups. Similar results were obtained by El-Adawy *et al.* (2000) using 0.1 and 0.2 % Lact-A-Bac in rabbit diets. Also, El-Sayaad (1997) reported that

dietary supplementation with 100 mg Flavomycin /kg diet increased the relative economical efficiency % in rabbits from 100 to 116.56%, where Radwan *et al.* (1996) found that economical efficiency values were not affected by using Virginiamycin or Lacto-Sacc in the rabbit diets. The lowest values of REE were recorded in groups received Vit. C indicating that its effect in improvement of FCR compared with the control did not compensate the relative high price of Vit.C compared with the price of Roemin W2®.

Concussively, it could be concluded that Roemin W2® supplementation to the growing rabbits caused relatively considerable improvement in the growth performance without negative effects on constituents of blood serum, health condition and gave the best economical efficiency.

Table (2): Gowth performance of growing NZW rabbits from 5 to 11 weeks of age as affected by water supplementation with either vit. C or probaiotic (Roimen W2®).

Items	Control	Vitamin C mg /L water		Roemin W2® mg /L water		Sig.
		500	1000	500	1000	
Body weight (g) at:						
5 weeks	663.29±19.28	664.19±6.12	656.67±31.82	639.29±36.42	665.67±17.46	NS
11 weeks	1634.29^{b}±21.67	1692.00^{ab}±14.53	1648.17^{ab}±19.47	1634.86^{b}±22.16	1703.83^{a}±14.66	*
T. weight gain(g)*	971.00 ^{b}±8.43	1027.81^{ab}±13.81	991.50 ^{ab}±27.67	995.57^{b}±15.56	1038.16 ^{a}±17.98	*
D. weight gain(g)*	23.12 ^{b}±0.20	24.47 ^{ab}±0.33	23.61 ^{ab}±0.66	23.70 ^{ab}±0.37	24.72 ^{a}±0.43	*
T. feed consumption (g)*	3272.86±59.98	3408.00±87.53	3148.00±102.07	3150.86±231.31	3135.00±121.85	NS
D. feed consumption (g)*	77.93±1.43	81.14±2.08	74.95±4.06	75.02±5.51	74.64±2.90	NS
FCR (g feed/g gain)*	3.37±0.04	3.32±0.06	3.17±0.16	3.17±0.24	3.02±0.16	NS

^{a,b} means with different superscripts within rows are significantly different (P≤0.05), * T=Total, D= Daily, FCR= Feed conversion ratio

Table (3): Some blood component of NZW rabbits as affected by supplementation with either vit. C or probaiotic (Roimen W2®).

Items	Control	Vitamin C mg /L water		Roemin W2® mg /L water		Sig.
		500	1000	500	1000	
Serum constituents						
Total protein (mg/dl)	5.43^{b} ± 0.12	5.69^{b} ± 0.23	6.32^{a} ± 0.08	6.55^{a} ± 0.18	6.65^{a} ± 0.11	*
Creatinine (mg/dl	1.22 ± 0.02	1.24 ± 0.001	1.24 ± 0.01	1.23 ± 0.01	1.26 ± 0.02	N.S
Uric acid (mg/dl)	1.31 ± 0.01	1.30 ± 0.02	1.32 ± 0.01	1.31 ± 0.03	1.29 ± 0.01	N.S
Total lipids (mg/dl)	344.00^{a} ± 2.19	336.00^{b} ± 1.42	331.00^{b}±0.73	334.67^{b} ± 1.03	332.34^{b} ±1.39	*
Triglycerides (mg/dl)	82.64^{a} ± 1.04	79.16^{b} ± 0.64	77.57^{b} ± 0.54	78.38^{b} ± 0.50	78.05^{b} ± 0.10	*
Cholesterol (mg/dl)	79.22^{a} ± 0.21	78.35^{ab} ± 0.19	77.01^{c} ± 0.49	77.44^{bc} ± 0.12	76.39^{c} ± 0.41	*
GOT (U/l)	21.01 ± 0.21	21.15 ± 0.31	21.19 ± 0.17	21.02 ± 0.54	21.17 ± 0.14	N.S
GPT (U/l)	12.32 ± 0.40	12.35 ± 0.22	12.37 ± 0.20	12.31 ± 0.02	12.35 ± 0.25	N.S

^{a,b,c} means with different superscripts within rows are significantly different (P≤0.05).

Table (4): Economic efficiency of growing NZW rabbits as affected by water supplementation with either vit. C or probaiotic (Roimen W2®).

Items	Control	Vitamin C mg /L water		Roemin W2® mg /L water	
		500	1000	500	1000
Initial body weight (g)	663.29	664.19	656.67	639.29	665.67
Final body weight (g)	1634.29	1692.00	1648.17	1634.86	1703.83
Body weight gain (BWG) (g)	971.00	1027.81	991.50	995.57	1038.16
BWG revenue (L.E.)	12.6230	13.3615	12.8895	12.9424	13.4961
Feed consumption (kg)	3.273	3.408	3.148	3.151	3.135
Feed cost (L.E.)	4.9095	5.1120	4.7220	4.7265	4.7025
Daily water consumption (ml/rabbit)	250	317	290	305	249
Additive consumption (g)	0.00	6.67	12.18	6.37	10.46
Additive cost (L.E.)	0.00	0.2868	0.5237	0.2229	0.3661
Total feed cost (L.E.) [1]	4. 9095	5.3988	5.2457	4.9495	5.0686
Net revenue (L.E.)[2]	7.7135	7.9627	7.6438	7.9929	8.4275
Economical efficiency (%) [3]	157.1138	147.4902	145.7155	161.4890	166.2688
Relative Economical efficiency (%) [4]	100	93.88	92.75	102.79	105.83

Local price of one kg live body weight was 13 L.E. (2006).
Price of kg Vitamin C was 43 L.E. Price of kg Roemin W2® was 35 L.E.
Local price of kg feed was 1.5 L.E. (2006).
[1] Total feed cost (L.E.) = Feed cost + Additive cost.
[2] Net revenue = BWG revenue - Total feed cost.
[3] Economic efficiency %= Net revenue/ Total feed cost*100
[4] Relative economic efficiency, assuming the control treatment = 100%.

REFERENCES

Abd El-Azeem, F. (2002). Digeston, Neomycin and yeast supplementation in broiler diets under Egyptian summer conditions. Egypt. Poult. Sci., 22 (1):235-257.

Abdel-Hamid, E. A. and M. M. El-Adawy (1999). Growth and physiological performance of New Zealand white rabbits fed diet supplemented with ascorbic acid. Egypt. Poult. Sci., 19: 857-871.

Abdel-Monem, M. U. (2001). Dietary supplementation with ascorbic acid and its effects on productive and reproductive performance of New Zealand White rabbits, under the summer condition of Egypt. 2nd international conference on animal production and health in Semi- Arid area, El-Arish- North- Sinai, 4-6 Sept., 2001.

Abdel-Samee, A. M. (1995). Using some antibiotics and probiotics for alleviating heat stress on growing and doe rabbits in Egypt. World Rabbit Sci., 3 (2), 107-111.

Al-Shanty, H. (2003). Using vitamin C and sodium bicarbonate to alleviate the effect of heat-stress on rabbit performance. Egypt. Poult. Sci., 23 (I):129-139.

Association of Official Analytical Chemists. (1995). Official Methods of Analysis. 16th Ed. Published by the A.O.A.C., Washington, D.C., USA.

Duncan, D. B. (1955). Multiple Range and Multiple F tests. Biometrics, 11:1-42.

El-Adawy, M. M., B. E. Borhami and S. M. Bassuny (2000). Effect of Lact-A-Bac vs Stafac*20 on the performance of growing New Zealand White rabbits. Egyptian J. of Rabbit Sci., 10 (1): 43-59.

El-Adawy, M. M., B. E. Borhami, Salwa G. Genedy and E. M. A. Qota (2002). Effect of diet supplementation with biogen on digestibility and growth performance of growing rabbits. 3rd Conf. on Rabbit Prod. in Hot Climates, Hurghada, (Egypt), 525 539.

El-Sayaad, G. A. E. (1997). Flavomycin as growth promoter for rabbit diets. Egyptian J. of Rabbit Sci., 7 (1):47-56.

Fortun-Lamothe, L. and F. Drouet-Viard (2002). Review: II.-Diet and immunity: current state of knowledge and research prospects for the rabbit. World Rabbit Sci., 10 (1): 25-39.

Fuller, R. (1989). Probiotics in man and animals. J. Appl. Bacteriol., 66:365-378.

Gippert, T., G. Y. Virág and I. Nagy (1992). Lacto-Sacc in rabbit nutrition. J. Appl. Rabbit Res., 15, 1101-1104.

Guillot, J. F. (2001). Consequences of probiotics release in the intestine of animals. In Brufau J. (Ed.). Feed manufacturing in the Mediterranean region. Improving safety: From feed to food. Zaragoza: CIHEAM-IAMZ, p. 17-21.

Hoyos, G. and C. Cruz (1990). Mecanismos de accion propuestos de los probiotics en cerdos. Biotechnology en la Industria, de Alimentaction Animal, 1:73.

Ibrahim, S. H. A. M. (2005). Effect of some different sources of vitamin C on performance of New Zealand growing rabbit in hot climates. Egypt. Poult. Sci., 25 (3): 845-861.

Ismail, F. S. A., M. H. Rabie and A. E. Abd El-Khalek (2004). Effects of some sources of yeast culture as feed additives on growth performance of New Zealand White rabbits. Egyptian J. of Rabbit Sci., 14(2): 101-116.

Mahdavi, A. H., H. R. Rahmani and J. Pourr (2005). Effect of probiotic supplements on eza egg quality and laying hen's performance. International Journal of Poultry Science 4 (7): 488-492.

Marai, I. F. M., M. S. Ayyat and U. M. Abdel-Monem (2000). Young doe rabbit performance traits as affected by dietary, zinc, copper, calcium or magnesium, under winter and summer condition of Egypt. Proceedings of the 7th World Rabbit Conference, Spain, 8: 313-320.

Marai, I. F. M., M. S. Ayyat, H. A. Gabr and U. M. Abdel-Monem (1999). Growth performance, some blood metabolites and carcass traits of New Zealand White broiler male rabbits as affected by heat stress and its alleviation, under hot summer condition of Egypt. Proc. 2nd Int. Conf. on Rabbit Prod. in Hot Climates, Turkey, 41:35-42.

N.R.C. (1984). National Research Council. Nutrient Requirements of Domestic. Nutrient Requirements of Rabbits. The 2nd Revised Edition. National Academy of Science. Washington. D.C. USA

Paulius Matusevičius, Lina Ašmenskaitė, Ana Žilinskienė, Andrzej Gugolek, Manfred O. Lorek and Areta Hartman (2006). Effect of probiotic BIOPLUS 2B® on performance of growing rabbit. ISSN, 1392-2130. VETERINARIJA IR ZOOTECHNIKA. T. 36 (58).

Radwan, M. O., A. Asker, N. El-Nagaar and A. Abdel Lateef (1996). Lacto-Sacc and Virginiamycin supplementation for growing rabbit under suptrobical conditions.. Egyptian J. of Rabbit Sci., 6 (2): 99-108.

SAS Institute. (1998). SAS, procedure Guide: Statistics. Version 12 Ed. "SAS" Institute Inc., Cary, NC, USA

Shanmuganathan, T., K. Samarasinghe and C. Wenk (2004). Supplemental enzymes, yeast culture and effective microorganism culture to enhance the performance of rabbits fed diets containing high levels of rice bran. Asian, Australasian, J. of Animal Science, 17(5): 678-683

Soliman, A. Z. M., R. I. El-Kady, A. A. El-Shahat and M. Z. Sedik (2000). Effect of some commercial growth promotors on the growth performance and caecum microbiology of New Zealand White rabbits. Egyptian J. of Rabbit Sci., 10 (2): 239-252.

Teeter, R. G. (1995). Optimizing production of heat stressed broilers. Proceeding of the International Conference on Animal Production in Hot Climates. Muscat. Sultanate of Oman, 8-10 January, 1995: 129-137.

Tollba, A. A. H., M. M. Sabry and G. G. Medani (2004). Effect of microbial probiotic on performance of broiler chicks under normal or heat stress condition. 2- Bacteria concentration or yeast culture. Egypt. Poult. Sci. 24 (2): 333-349

Tortuero, F., A. Brenes and J. Rioperez (1975). The influence of intestinal (cecal) flora on serum and egg yolk cholesterol levels in laying hens. Poultry Sci. 54: 1935–1938.

Zanaty, G. A. (2002). The use of biogen as a natural growth promoter for growing New Zealand White rabbits. 3rd Conf. on Rabbit Prod. in Hot Climates, Hurghada, (Egypt), 507-523.

Zeweil, H. S., Salwa, G. Genedy and M. Bassiouni (2006). Effect of probiotic and medicinal plant supplements on the production and egg quality of laying Japanese quail hens. XII European Poultry Conference, 10-14 Septemper, Verona, Italy.

Zeweil, H. S., M. H. Ahmed, M. Zaitoun and H. El Sheikh (2007). Effect of probiotic supplementation to broiler diets on performance, carcass and sensory evaluation. XVIII European Symposium on the quality of poultry meat, 2-5 September, Prague, Czech Republic.

تأثير إستخدام فيتامين ج وبروبيوتك الرومين على الكفاءة الإنتاجية للأرانب النيوزيلندي الأبيض النامية

هيام سيد عبد الحليم أحمد

قسم الإنتاج الحيواني- كلية الزراعة- جامعة قناة السويس- الإسماعيلية- مصر

أجريت هذه الدراسة علي ٥٠ ذكر من أرانب النيوزيلندي الأبيض في عمر٥ أسابيع وبمتوسط وزن ٦٥٢ ± ٦٦ جم لدراسة تأثير إضافة فيتامين ج والرومين (مستحضر ميكروبي تجاري) في مياه الشرب علي كفاءة النمو وبعض مكونات الدم لذكور الأرانب النيوزيلندي الأبيض أثناء شهور الصيف. تم توزيع الأرانب عشوائيا علي خمس معاملات (١٠ أرانب في كل معاملة) تم تسكين كل أرنب في قفص منفصل في عنبر مفتوح وكانت الأرانب تحت نفس الظروف المعيشية والصحية والإدارية ، وكان متوسط درجة حرارة البيئة المحيطة ٣٢,٩ °م و الرطوبة النسبية ٥٨,٤ %. وكانت المعاملات كالتالي : مياه الشرب بدون اضافة (مجموعة مقارنة) ، أما المعاملات من ٢-٥ تم إضافة فيتامين ج أو الرومين بتركيز ٠,٥ ، ١جم/لتر ماء من كلا منهما ، وإستمرت الدراسة لمدة ستة أسابيع. ويمكن تلخيص النتائج كالتالي:

تأثر كل من وزن الجسم ، الزيادة الكلية واليومية فى الوزن ، محتوى السيرم من البروتين والدهون الكلية والجلسريدات الثلاثية الكلية والكوليستيرول تأثرا معنويا ($P\leq0.05$) بسبب إضافة فيتامين ج والرومين في مياه الشرب. الأرانب التى تناولت المياه المضاف اليها ١ جم من الرومين / لتر أعطت أعلى القيم لكل من الوزن النهائى للجسم والزيادة الكلية واليومية في الوزن ومحتوى السيرم من البروتين وكانت الفروق بينها وبين مجموعة المقارنة معنوية ($P\leq0.05$). وكانت قيمة الزيادة اليومية في وزن الجسم بالنسبة لهذه المجموعة متفوق معنويا ($P\leq0.05$) بمعدل ٦,٩٢ % عن مجموعة المقارنة. كما أظهرت النتائج أيضا أن المجاميع التي تناولت كلا من فيتامين ج والبروبيوتك أعطت أفضل كفاءة تحويلية ، و كانت قيم التحسن أعلي من مجموعة المقارنة بمعدل ١,٤٨ ، ٥,٩٣ ، ٥,٩٣ ، ١٠,٣٩ % علي الترتيب. بالإضافة إلي إنخفاض محتوي السيرم من الدهون الكلية والجلسريدات الثلاثية والكوليستيرول معنويا ($P\leq0.05$) بالنسبة للمجموعات التي تناولت المياه المضاف اليها كلا من فيتامين ج أو الرومين عن مجموعة المقارنة. لم يتأثر كلا من وظائف الكلية ووظائف الكبد بإضافة كلا من فيتامين ج أوالرومين إلى مياه شرب الأرانب. أظهرت النتائج تحسن الكفاءة الإقتصادية والكفاءة الإقتصادية النسبية لمجموعة الأرانب التي تناولت المياه المضاف اليها الرومين بمستوي ٠,٥ ، ١ جم / لتر ماء بالمقارنة بباقي المجموعات.

تشير نتائج البحث إلي أن بروبيوتك الرومين يمكن إضافته بمعدل ٠,٥ أو ١ جم/لتر من مياه شرب الأرانب النامية الواقعة تحت تأثير الإجهاد الحراري بأمان دون حدوث أي تأثيرات ضارة علي كفاءة النمو أو الحالة الصحية ، و أنها أعطت أفضل كفاءة إقتصادية.